

Results of the Five-Year Wheat-Belt Extension Program

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RESULTS OF THE FIVE-YEAR WHEAT-BELT EXTENSION PROGRAM

A Study of 343 Farms in Ford and Pawnee Counties, Kansas, 1930

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DISTRIBUTION: One copy of this circular has been sent to each State extension director; State and assistant State agricultural agent leader; specialist in marketing, agronomy, entomology, and plant pathology; and to each agricultural-college and experiment-station library.

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SCOPE OF STUDY

This circular is a report of a study of the effectiveness of five years of intensive extension work with wheat and rotated crops, carried on by the cooperative extension service in the wheat area of western Kansas. Data are presented regarding the current wheat-growing practices of farmers in the wheat belt and the various contacts of wheat growers with extension activities, extension workers, and local extension leaders.

The study reported deals also with the effectiveness of extension teaching in influencing wheat farmers to follow the wheat-growing recommendations of the extension service, the means and agencies employed in disseminating wheat information, and the extent to which these means and agencies have been responsible for influencing farmers to adopt improved wheat production and marketing practices.

For the first time in connection with an extension study of this kind, some data are presented as to the economic value of the improved practices adopted. The recommended wheat-growing practices are evaluated in terms of increased yields per acre of wheat.

COLLECTION OF DATA

Prior to collection of the field data an analysis was made of the extension activities conducted over a period of years in the counties selected for the study, in order to single out those activities which might have had any bearing upon the production and marketing of wheat. A record was also made of the recommended practices which had been included in the wheat extension program.

The field data were collected by the personal interview-survey method. The survey party comprised experienced extension workers, largely supervisors and subject-matter specialists. After thoroughly reviewing the wheat extension program and activities of the areas, and receiving detailed instruction regarding the use of the questionnaire cards (figs. 1a and 1b) and the interview method, each member of the party was assigned certain roads and was held responsible for interviewing all the farmers residing along those roads.

Conferences were held each night to insure uniform treatment of information, and each day records for the preceding day were checked for incompleteness and inconsistency and additional information was obtained where necessary.

The field data were collected during October, 1930, a total of 343 farm records being obtained; 145 in Ford County and 198 in Pawnee county. (Fig. 2).

No. _____ Co. _____ SURVEY OF RESULTS OF 5-YEAR WHEAT PROGRAM Date _____
 Name _____ Address _____ Community _____
 Owner _____ Tenant _____ Size of farm _____ Years farming _____ Years this farm _____
 Kind of road _____ Miles to ag'ts office _____ Telephone _____ Radio _____
 Stations from which useful farm information is obtained _____
 Membership in Farm Bureau: Present _____ Past _____ (Why disc't'd.) _____
 Member what other farmers' organization _____
 Acres wheat grown 1930 _____ Bu. _____ Variety _____ Pure seed sown _____
 Seed treated for smut _____ Method of treatment _____
 Wheat land rotated _____ Date land summer-fallowed or plowed _____
 Date wheat sown _____ Where is wheat sold _____
 On quality basis _____ Leadership in wheat program _____ Wheat extension activi-
 ties on farm _____ Contact with co. ag't _____
 Specialists _____ Name of local leader of wheat program _____
 Nature of first contact with wheat leader _____
 Did other contacts follow _____ Nature of assistance obtained from
 local leader _____
 Is local leader plan satisfactory? _____
 Further development of local leader plan desired _____
 Is direct contact with extension agents preferred _____
 Did you attend wheat train _____ Obtain any useful information _____
 Did you go on wheat tour _____ Obtain any useful information _____

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Figure 1a. - Obverse side of questionnaire card used in collecting data.

Check extension activities relating to wheat program attended or personal contacts
 with extension agents regarding wheat program:-

Result demonstration adult (dem.a.) _____; Junior (dem.Jr.) _____ Method demonstration
 meeting(m.dem.) _____ General meeting(mtg.) _____ Leader training meeting(l.tr.) _____
 Extension school(e.s.) _____ Study course(st.c.) _____ Bulletin(bul.) _____ Circular
 letter(cir.l.) _____ News story(n.s.) _____ Exhibit(exh.) _____ Farm visit(f.v.) _____
 Office call(o.c.) _____ Telephone call(tel.) _____ Correspondence(cor.) _____ Radio(r.) _____
 Indirect(ind.) _____ (Agricultural Train(tn.) _____ Automobile tour(a.t.) _____)

Check wheat practices adopted due to Extension influence _____;		Other _____	
Practice	Extension method : responsible	Spe- : C.A. ; cialist	Local : leader ; agencies contributing
Crop rotation	:	:	:
Pure seed adaptable variety	:	:	:
Seed treatment	:	:	:
Date of seeding	:	:	:
Summer-fallowing	:	:	:
Early cultivation	:	:	:
Poisoning grasshoppers	:	:	:
Sold on quality basis	:	:	:
Use of outlook information	:	:	:
	:	:	:
	:	:	:
	:	:	:
	:	:	:
Educational training _____	Age _____	Attitude _____	

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Figure 1b. - Reverse side of questionnaire card used in collecting data

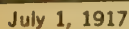


Figure 2.-- Map of Kansas showing where 5-year wheat program was conducted, and areas included in study

CONDUCTING WHEAT EXTENSION IN KANSAS

Extension work in wheat growing has, of course, been carried on in Kansas since before the organization of the cooperative extension service in 1914. In order to intensify the extension attack on the various wheat problems, a so-called 5-year wheat-belt program was inaugurated in 1926 and consistently developed during the succeeding years. The 5-year wheat program was sponsored by the extension service of the State agricultural college and the United States Department of Agriculture in cooperation with the Kansas State Board of Agriculture; the Southwestern Wheat Improvement Association; the Atchison, Topeka & Santa Fe Railway Co.; Chicago, Rock Island & Pacific Railway Co.; the Union Pacific Railway Co.; the Kansas Crop Improvement Association; the Kansas City (Mo.) Chamber of Commerce; the Kansas State Grain Inspection Department; the Federal Grain Inspection Department; Hutchinson Chamber of Commerce; local chambers of commerce; and county farm bureaus throughout the Kansas wheat belt.

The program provided for improvement along the lines of marketing, agronomy, entomology, and plant pathology. The work in marketing dealt with the handling of wheat on a quality basis and a careful study of market conditions as a guide to marketing. The agronomy work considered the proper handling of the soil to conserve moisture and furnish a sufficient supply of available nitrates to grow a profitable crop, and the use of pure seed of adapted varieties. The work in entomology presented the best methods of controlling those insects which affected the wheat crop, such as the Hessian fly, chinch bug, wireworm, and wheat strawworm. The principal part of the plant pathology work was the control of smuts.

The goals to be reached at the end of the 5-year program were:

1. Insect control practiced by 80 per cent of the farmers
2. Smut of wheat and sorghum controlled by 80 per cent of the farmers.
3. Market reports followed by 20 per cent of the farmers.
4. Wheat sold on quality and grade basis by 80 per cent of the farmers.
5. Standard varieties of all crops grown by 80 per cent of the farmers.
6. Crop rotation practiced by 15 per cent of the farmers.

While the 5-year program involved sustained extension effort throughout the whole period, an annual program was drawn up by conferences of participating agencies each fall. The 1930 annual program may be taken as typical of the preceding years. The plans made at the November, 1929, conference provided for a publicity campaign throughout the wheat belt from January until the end of the train schedule, and for four seasonal campaigns of extension activity covering the area. The first of these was a series of 2-day district schools in January and February. These were attended by 520 farmer delegates and the county agents of the wheat belt.

Ten district grain-grading meetings were held during April, the Federal and State grain-inspection agencies cooperating in giving elevator managers information on methods of grading wheat.

In June the farmers were given opportunity to see result demonstrations in the various counties where the advantages of the recommended cultural practices were proved by means of local field plots.

The climax of the year's activities was the agricultural train, run during July and August, which carried exhibits pertaining to each of the phases of the wheat-belt program. Specialists in all phases of the program accompanied the train, which covered all the wheat-belt counties served by two railroad lines.

Ford and Pawnee Counties were selected as being typical of the wheat-belt area of the State. Pawnee has had a county agricultural agent since 1916, four different men having held the position during the 14-year period. Ford County has had three county agricultural agents since the inception of organized extension work in that county in 1918.

During the period covered by the 5-year wheat-belt program the same entomologist, two different marketing specialists, two different agronomists, and three different plant pathologists have respectively filled the positions of State extension specialists in these subject-matter fields.

GENERAL INFORMATION REGARDING FARMS INCLUDED IN STUDY

The farms included in the study averaged 523 acres in size. Two-thirds of them were operated by owners and one-third by tenants. (Table 1.) The operators had lived on the present farm a little less than 13 years on the average, but had operated farms on their own responsibility a total of 20 years.

The farms were located an average of 13.4 miles from the extension office at the county seat. Telephones were found in 9 homes out of 10 and radios in 7 out of every 10 homes visited.

The county farm bureau counted among its members 35 per cent of all the farmers interviewed. An additional 24 per cent had been farm-bureau members formerly, but had dropped out for various reasons. Approximately 57 per cent of the farmers belonged to farmers' organizations other than the farm bureau, principally to a cooperative elevator association.

Table 1. - General information regarding farms included in study

Item	: : Number	: Percentage : of all farms
Farm records obtained.....	343	100
Farms operated by owner.....	232	67.6
Farms operated by tenant.....	111	32.4
Farms with telephone.....	305	88.9
Farms with radio.....	240	70.0
Present members of farm bureau.....	121	35.3
Former members of farm bureau	84	24.5
Member of other farmers' organizations.....	194	56.6
Average size of farm (acres).....	523	-
Average years operator has farmed.....	20.2	-
Average years operator has farmed present farm.....	12.7	-
Average distance to county extension office (miles)...	13.4	-
Average acres of wheat harvested, 1930.....	369	-
Average yield per acre (bushels).....	11.6	-

That the area studied is a specialized wheat area is evident from the fact that the farmers interviewed harvested an average of 369 acres of wheat in 1930, which yielded 11.6 bushels per acre.

WHEAT-GROWING PRACTICES FOLLOWED

Varieties of Wheat. The three most important varieties of wheat grown on the farms studied were Turkey Red, Blackhull, and Kanred, nearly 99 per cent of all farms growing these varieties. (Table 2.) The sowing of pure seed had become a well-established practice, being reported by 67 per cent of the farms.

Rotation of Wheatland. That wheat should not be grown continuously was the belief of approximately 35 per cent of the farmers who were alternating wheat with summer-fallow, a row crop such as corn, or a legume crop such as alfalfa or sweetclover. (Table 3.)

Table 2. - Varieties of wheat grown and pure seed sown

Variety harvested in 1930	Number of farms	Percentage of all farms
Turkey Red only.....	144	42.0
Blackhull only.....	101	29.4
Blackhull and Turkey Red.....	70	20.4
Kanred only.....	11	3.2
Blackhull and Kanred.....	7	2.0
Turkey Red and Kanred.....	5	1.4
Other varieties or combinations of varieties.....	5	1.4
Pure seed sown in 1930.....	231	67.3

Table 3. - Rotation of wheat land

Item	Number of farms	Percentage of all farms
Number of farms rotating wheatland.....	119	34.7
Wheatland rotated with:-		
Summer-fallow only.....	50	42.0
Row crops only.....	27	22.7
Legumes only.....	5	4.2
Summer-fallow and row crops.....	15	12.6
Legumes and summer-fallow.....	2	1.7
System not specified.....	20	16.8

Preparation of Wheatland. Early preparation of wheatland in order to conserve moisture, keep down volunteer wheat, and for other purposes was rapidly becoming the accepted practice, as indicated by the fact that 60 per cent of the farmers completed the first tillage of their 1931 wheatland by August 1, while 85 per cent had completed this primary operation by August 10. (Table 4.) The moldboard plow was the implement used exclusively for the first tillage operation on 37 per cent of the farms, and used in combination with other implements on an additional 38 per cent of the farms. (Table 5.)

The one-way disk was used exclusively on 14 per cent of the farms, and in combination with other implements on 34 per cent more of the farms. Only 6 per cent of the farmers reported using the lister only, while 21 per cent more used it along with other tillage implements.

Table 4. - Dates first tillage of wheatland was finished
(332 farms reported date tillage was finished)

Date	Number of farms	Percentage of farms
Before July 1.....	9	2.7
July 1 - 10.....	29	8.7
July 11 - 20.....	93	28.0
July 21 - 31.....	70	21.1
August 1 - 10.....	83	25.0
August 11 - 20.....	33	9.9
August 21 - 31.....	9	2.7
After September 1.....	6	1.8

Table 5. - Tillage implements used in preparing wheatland
(306 farms reported tillage implements used)

Implement	Number of farms	Percentage of farms
Moldboard plow only.....	112	36.6
Moldboard and one-way disk.....	70	22.9
One way only.....	42	13.7
Moldboard and lister.....	30	9.8
One way and lister.....	20	6.5
Lister only.....	17	5.6
Moldboard, one way, and lister.....	15	4.9

Seed Treatment. Treatment of the seed grain to control smut was reported as a regular practice on 42 per cent of the farms. (Table 6.) Of the farmers treating, 13 per cent used formaldehyde while 86 per cent were using copper-carbonate dust, a more recently developed method of wheat-seed treatment. Of those using copper carbonate, 64 per cent applied it by means of a commercial seed-treating machine.

Date of Seeding Wheat. The bulk of the wheat acreage planted in the fall of 1930 was sown between September 11 and October 20. (Table 7.) The drilling of wheat on 67 per cent of the farms was started by September 20. Drilling was not finished until October 1 or later on 62 per cent of the farms. The large acreage of wheat per farm, 369 acres, doubtless makes it necessary for many farmers to start seeding wheat considerably in advance of the date set to avoid danger of Hessian-fly damage.

Table 6. - Method of treating wheat for smut

Method	Number of farms	Percentage of farms
Farms treating seed for smut (1929 or 1930).....	143	41.7
Material used to treat seed:		
Copper carbonate.....	123	86.0
Formaldehyde.....	19	13.3
Copper carbonate and formaldehyde.....	1	.7
Copper carbonate applied by means of:		
Commercial machine.....	79	64.2
Shovel.....	23	18.7
Barrel.....	21	17.1

Table 7. - Dates wheat was sown in 1930
(340 farms reported date sowing began and
338 farms reported date sowing finished)

Date	Began sowing		Finished sowing	
	Number of farms	Percentage of farms	Number of farms	Percentage of farms
September 1 - 10.....	60	17.6	6	1.8
September 11 - 20.....	167	49.1	36	10.6
September 21 - 30.....	89	26.2	85	25.1
October 1 - 10.....	23	6.8	131	38.8
October 11 and later.....	1	.3	80	23.7

Method of Selling Wheat. That all of the 1930 wheat sold to date of collection of data had been marketed through cooperative elevators was reported by 63 per cent of the farmers. (Table 8.) An additional 9 per cent sold part of their wheat through cooperative elevators. Twenty-eight per cent of the farmers marketed their wheat entirely through noncooperative agencies.

Approximately 50 per cent of the farmers sold their wheat on the basis of purity and protein content.

Table 8. - Method of selling wheat
(331 farms reported on co-operative selling of wheat)

How sold	Number of farms	Percentage of farms
Farmers selling cooperatively only.....	208	62.8
Farmers selling noncooperatively only....	93	28.1
Farmers selling both ways.....	30	9.1
Farmers selling wheat on quality basis....	170	49.6

CONTACT WITH WHEAT EXTENSION

Local leaders had been selected to assist with the wheat-extension program at the rate of one leader to 26 farms. (Table 9.) Formal extension activities relating to the wheat program were reported held on one farm out of 16. For the most part these activities were either result demonstrations or various kinds of field meetings.

Contact with the county agricultural agent and the subject-matter specialists was reported for 83 per cent and 60 per cent of the farms respectively. That they had been in touch with the local wheat leaders was reported by 28 per cent of the farmers. For the most part local leaders had worked with farmers who were also in touch with the paid extension workers, since 88 per cent of all farmers reported contacts with either extension workers or local leaders. The influence of local leaders upon the adoption of wheat practices will be brought out later. (Table 14.)

That the wheat train has been an important means of focusing attention upon the wheat program is evident from the fact that 63 per cent of the farmers interviewed had visited one or more of the five trains operated through the counties involved in the study. The majority of the method demonstration meetings, many of the general meetings, and all of the exhibits relating to wheat were held also in connection with wheat trains, which further emphasizes the key position of agricultural trains in the wheat-belt extension program.

Table 9. - Contact with wheat extension

Item	Number	Percentage of all farms
Farmers serving as local leader of wheat program.....	13	3.8
Farms on which wheat-extension activities have been conducted.....	22	6.4
Farmers having had contact with county agricultural agent.....	285	83.1
Farmers having had contact with subject-matter specialists.....	204	59.5
Farmers having had contact with local wheat leaders.....	96	28.0
Farmers having had contact with either extension workers or local leaders.....	303	88.3
Farmers who attended wheat train.....	217	63.3
Farmers who went on wheat tour.....	36	10.5

ATTITUDE TOWARD EXTENSION

In connection with each farmer visited the interviewer made an estimate of the farmer's attitude toward the entire extension service program, as revealed by the interview. (Table 10.)

Sixty-eight per cent of the farmers were recorded as favorable to the work, seven per cent as opposed, and twenty-five per cent as indifferent. Apparently not all of the farmers who participate in extension activities and make changes in their farm practices as the result of extension effort, can be classed as favorable to the work.

Table 10. - Attitude toward extension

Attitude	Number	Percentage of all farms
Favorable.....	234	68.2
Indifferent.....	84	24.5
Opposed.....	25	7.3

INFLUENCE OF EXTENSION UPON WHEAT PRODUCTION AND MARKETING PRACTICES

Having obtained information regarding the actual practices followed on each farm in the production and marketing of wheat, the next task of the interviewer was to learn whether the farmer was conscious of any extension influence whatever in his determination to adopt these practices. Obviously there were many instances where improved practices had been adopted as the result of information obtained from sources not connected with extension.

In order to refresh the farmer's memory and to inform the interviewer regarding possible extension influence, inquiry was made concerning the various extension activities and other sources of extension information on wheat growing to which each farmer might have been exposed. The correlation of practices adopted with the possible sources of extension information, in order to determine which practices had been adopted due to extension effort and which means and agencies had contributed to the adoption, was clearly the most difficult task connected with the study. It is possible that the individual farmer may not have recognized all of the teaching means and agencies which influenced him to make a particular change. It is equally possible that a farmer in frequent contact with extension activities may have been inclined to report all means and agencies to which he was exposed as contributing to a particular change, when in reality he was influenced by only one or two of them. The writers believe, however, that on the whole the information obtained from the farmers through careful questioning by experienced extension workers, furnishes a reasonably reliable picture of the effectiveness of the various means and agencies employed in extending subject-matter information relating to wheat production and marketing.

A very high percentage, 91, of the farmers interviewed, reported using extension information in making changes in their wheat-farming operations. The specific changes made or practices adopted are given in Table II.

Table 11. - Wheat practices changed due to extension

Item	Number of farms	Percentage of all farms
Records obtained.....	343	100
Farms adopting any wheat practice due to extension influence.....	313	91.2
Farms adopting improved practices in:		
Hessian-fly control.....	211	61.5
Poisoning grasshoppers.....	198	57.7
Early seed-bed preparation.....	192	56.0
Date of seeding.....	165	48.1
Seed treatment.....	157	45.8
Pure seed adaptable variety.....	138	40.2
Sorghum smut treatment.....	135	39.4
Summer-fallowing.....	84	24.5
Use of outlook information.....	78	22.7
Crop rotation.....	62	18.1
Sold on quality basis.....	59	17.2
Shovel-type cultivator.....	53	15.4
Other insects.....	43	12.5
Bindweed control.....	11	3.2
Miscellaneous.....	3	0.9

That steps were being taken to control Hessian flies was reported by approximately 62 per cent of all farmers interviewed. The poisoning of grasshoppers in accordance with extension recommendations was reported by 58 per cent. The practice of early cultivation of wheatlands was reported by 56 per cent of the farmers. Changes in date of seeding, and the treatment of seed to control smut involved 48 per cent and 46 per cent of the farms respectively. On approximately 40 per cent of the farms the variety of wheat grown had been changed or pure seed had been sown in accordance with extension recommendations. The treating of sorghum seed for smut had been practiced on 39 per cent of the farms. Summer-fallowing to conserve moisture and kill weeds was reported as having been practiced on 24 per cent of the farms.

That the economic side of wheat production and marketing has not been overlooked is evidenced by the fact that nearly 23 per cent of the farmers interviewed reported the use of current outlook information. Rotation of wheatland, the marketing of wheat on the basis of quality, and the use of the shovel type of tillage implements were other practices reported by a substantial percentage of the farmers.

Effectiveness of Means and Agencies Employed in Wheat
Extension As Related to Their Use

All but three per cent of the 345 wheat growers interviewed had been exposed to wheat extension information in one way or another, according to their own statements. (Table 12.) Discussing extension recommendations with neighbors, reading extension news articles, attendance at wheat meetings, perusal of a wheat bulletin from the agricultural college or the United States Department of Agriculture, and receipt of a circular letter about wheat are means which were responsible for carrying information to from 60 to 75 per cent of the farmers. More than half of the farmers had visited the extension office to make inquiries regarding wheat growing, had attended a method demonstration, or had seen a wheat exhibit -- the last two in many cases in connection with agricultural trains. Calls at the farm by extension workers to discuss wheat problems were reported by 41 per cent of the farmers. Forty-four per cent had heard extension talks on wheat over the radio. Demonstration wheat fields conducted by neighboring farmers had been inspected by 26 per cent of the farmers.

Table 12. - Comparative effectiveness of extension methods used
wheat program

Method	Percentage of farmers exposed to methods	Percentage of farmers influ- enced by methods to adopt prac- tices	Percentage ex- posed who were influenced
Indirect.....	75.51	71.43	94.59
News story.....	72.89	46.06	63.20
General meeting.....	69.10	49.85	72.15
Bulletin.....	65.60	25.95	39.56
Circular letter.....	64.43	23.03	35.75
Exhibit.....	58.02	10.20	17.59
Office call.....	55.68	27.40	49.21
Method-demonstration meeting.....	51.31	39.94	77.84
Radio.....	44.02	13.99	31.79
Farm visit.....	41.40	12.54	30.28
Result demonstration, adult.....	25.95	14.58	56.18
Telephone call.....	19.53	9.58	2.98
Correspondence.....	9.04	1.17	12.90
Leader-training meeting.....	7.29	4.08	56.00
Result demonstration, junior.....	3.50	0.29	8.33
Any method.....	97.08	91.25	93.99

It is interesting to compare the percentage of farmers exposed to the various teaching means or agencies with the percentages who reported having been influenced by these same means or agencies to adopt improved wheat production and marketing practices. For convenience, the relationship of "takes" to "exposures" may be expressed as a ratio. Conversation with a neighbor who had tried the recommendation of the extension service, resulted in use of the information obtained in 95 per cent of the cases. The method-demonstration meeting and the general meeting also had very high ratios, 78 per cent and 72 per cent respectively. Of those farmers reading extension news items 63 per cent said they had been influenced by what they read. The result demonstrations and the schools conducted for the local wheat leaders each succeeded in influencing practices on 56 per cent of the farms reached by them.

Approximately half of the farmers coming to the extension office, and nearly four out of five of those receiving bulletins and circular letters relating to wheat, were influenced by what they were told or by what they read. Thirty-one per cent of the farmers listening to extension wheat talks over the radio mentioned the use of such information. Approximately the same ratio applies to those whom the extension workers called upon personally at the farms.

The fact that the wheat program had been carried on rather intensively for a 5-year period, with considerable repetition of "exposures" to the same kind of teaching means, doubtless has some bearing upon the large number of high ratios of "takes" to "exposures."

Relative Effectiveness of Means and Agencies

The frequency with which the various means and agencies were reported in connection with the adoption of improved wheat practices, offers the best opportunity to study their relative effectiveness. (Table 13.)

Table 13. - Methods influencing the adoption of improved practices in wheat growing

Method	Number of practices	Percentage of total practices adopted*
Total number of practices changed....:	1589	100
Indirect influence.....:	593	24.13
Meeting.....:	496	20.18
News service.....:	328	13.34
Method-demonstration meeting.....:	240	9.76
Office call.....:	156	6.35
Bulletin.....:	154	6.26
Circular letter.....:	136	5.53
Radio.....:	82	3.34
Adult result demonstration.....:	79	3.21
Farm visit.....:	66	2.68
Leader-training meeting.....:	61	2.48
Exhibit.....:	60	2.44
Correspondence.....:	4	0.16
Telephone.....:	2	0.08
Junior result demonstration.....:	1	0.04

* Percentages computed to basis - total influence of all methods equals 100 per cent. Actually the adoption of a single practice frequently involves two or more means or agencies.

To facilitate the comparison the data have been computed to the basis - total influence of all methods equals 100 per cent. In actual practice, of course, the making of a single change may be associated with two or more means and agencies.

Meetings of all kinds including method-demonstration meetings, leader-training meetings, and general meetings were credited with having influenced the adoption of 32 per cent of all practices changed.

The indirect spread of extension information from neighbor to neighbor accounted for 24 per cent of the practices adopted.

The extension news story was credited with 13 per cent of the changes in practices. The office call, the bulletin, and the circular letter were each credited with about 6 per cent. The radio influenced the adoption of 3 per cent of the practices changed, which compares favorably with adult result demonstrations and farm visits, each of which was credited with about 3 per cent of the practices adopted. Exhibits were credited with influencing over 2 per cent of the practices changed.

Extension Workers Credited with Influencing Adoption of Practices

Nearly 82 per cent of the farmers credited the county agricultural agent with having influenced them to adopt improved practices. The subject-matter specialists were given credit by 58 per cent. Twenty-four per cent also mentioned the influence of the local wheat leaders. (Table 14.)

On the basis of practices adopted 65 per cent of the practices were associated with the county agricultural agent, 40 per cent with the subject-matter specialist, and 12 per cent with the local wheat leaders.

Table 14. - Extension agents involved in adoption of improved wheat practices

Item	: Number :	: Percentage
Records obtained.....	343	100
Farms on which some wheat practice was adopted.....	313	91.2
Farms influenced to adopt wheat practices by:		
County agricultural agent.....	281	81.9
Specialist.....	200	58.3
Local leader.....	84	24.5
Wheat practices adopted.....	1589	100
Wheat practices adopted due to influence of:		
County agricultural agent.....	1033	65.0
Specialist.....	634	39.9
Local leader.....	183	11.5

Agricultural Trains

Because of the emphasis placed upon the agricultural train in the wheat-belt program it is interesting to bring together all the information obtained relating to trains. Two hundred and seventeen of the three hundred and forty three farmers interviewed reported having attended one or more wheat trains. Of those attending, 75 per cent stated that useful information had been obtained. Approximately one out of three, 32 per cent, of all the farmers interviewed mentioned wheat practices changed as the result of information obtained from the exhibits, demonstrations, and lectures held in connection with the trains. On the basis of those attending the trains 51 per cent were influenced to change wheat practices. About 15 per cent of all practices adopted were influenced by means and agencies associated with the wheat trains.

FACTORS AFFECTING THE ADOPTION OF WHEAT PRACTICES

In addition to the means and agencies employed in extending information on wheat production and marketing, it is probable that certain other factors may have contributed to the adoption or lack of adoption of the recommended practices.

Tenure

Approximately two-thirds of the farms included in the study were operated by owners, and one-third by tenants. From the standpoint of the percentages of farmers in the two groups making changes as the result of extension information, there is little difference between them. (Table 15.) The owners made nearly one-fourth more changes in wheat practices per farm than did the tenants. This may be due not so much to lack of desire on the part of tenants to make changes as to insistence of landlords that certain cropping systems be followed.

Table 15. - Tenure in relation to adoption of wheat practices

Group	: :Number of: : farms	:Percentage: : of all : farms	:Percentage of : farms adopting : wheat practices:	: : Number of prac- : tices adopted : per 100 farms
Owners.....	232	67.6	91.8	495
Tenants.....	111	32.4	90.1	397

Acreage of Wheat Grown

Whether the farmer grew 300 acres of wheat, or more, or less, seems to have had little bearing upon the use of extension information (Table 16), as measured either in percentages adopting practices or in the number of changes made per 100 farms.

Distance from County Extension Office

In general, farmers living closer to the county extension office reported the adoption of recommended wheat practices with a little greater frequency than did farmers farther away. (Table 17.) The advantage of those living nearer is expressed largely in terms of numbers of practices changed rather than in terms of percentages of farmers adopting practices.

Table 16. - Acreage of wheat grown in relation to adoption of wheat practices.

Group	: Number of farms	: Average number of acres in wheat	: Percentage of farms adopting wheat prac- tices	: Number of practices adopted per 100 farms
Under 300 acres.....	129	193	89.9	437
300-499 acres	144	376	92.4	472
500 acres and over.....	70	678	91.4	494

Table 17. - Distance from county extension office as bearing upon adoption of wheat practices

Distance	: Number of farms	: Average distance away in miles	: Percentage of farms adopt- ing wheat practices	: Number of practices adopted per 100 farms
9 miles and less.....	110	6.3	94.5	562
10 - 15 miles.....	106	12.3	90.6	453
16 miles and over.....	127	20.4	89.0	387

Kind of Road

As in the case of distance from the extension office, the kind of road upon which the farmstead is located seems to have had little bearing upon the acceptance of extension recommendations regarding wheat growing. (Table 18.) Only five per cent more of the farmers living on graded roads reported the adoption of wheat practices than was true of the farmers on ungraded roads. The farmers living on roads which had been surfaced did not report the adoption of as many wheat practices per farm as did the farmers on the graded roads not hard surfaced.

Table 18. - Kind of road in relation to adoption of wheat practices

Kind of Road	: Number of farms	: Percentage of all farms	: Percentage of farms adopt- ing wheat practices	: Number of practices adopted per 100 farms
Surfaced.....	23	6.7	91.3	422
Graded but not surfaced..	240	70.0	92.5	495
Ungraded.....	80	23.3	87.5	379

Educational Training of Farmers

Additional educational training beyond the eighth grade was consistently associated with increased use of wheat extension information. (Table 19.) The variation in percentages of farmers adopting improved practices in the three groups, eighth grade or less, high school but no college, and some college, is not great. However, the number of practices adopted per 100 farms is 631 for the college group as compared to 507 for the high-school group and 444 for the group with formal educational training of eighth grade or less.

Table 19. - Education of farmers as related to adoption of wheat practices

Group	Number of farmers	Percentage of all farmers	Percentage of farmers adopting wheat practices	Number of practices adopted per 100 farms
Eighth grade or less.....	268	78.1	91.0	444
High school but no college,,	59	17.2	91.5	507
Some college.....	16	4.7	93.8	631

Age of Farmers

As in all previous extension studies where the information has been obtained, there is no apparent relationship between age of farmers and the extent of adoption of improved practices. (Table 20.) The farmer over 50 years of age put into practice the wheat-growing recommendations of the extension service fully as readily as did the farmer 35 years of age or younger.

Table 20. - Age of farmers as related to adoption of wheat practices

Group	Number of farmers	Percentage of all farmers	Percentage of farmers adopting wheat practices	Number of practices adopted per 100 farms
30 years and under.....	50	14.6	86.0	374
31 - 35 years.....	35	10.2	88.6	428
36 - 40 years.....	55	16.0	92.7	533
41 - 45 years.....	54	15.7	92.6	509
46 - 50 years.....	48	14.0	95.8	585
51 - 55 years.....	33	9.6	90.9	421
56 - 60 years.....	47	13.7	93.6	411
61 years and over.....	21	6.1	85.7	338

When the age groups are compared on the basis of "exposures" and "takes", it is noted that the percentages of farmers influenced in relation to the numbers exposed to the extension activities are quite similar for all the age groups. (Table 20 a.)

Table 20 a. - Relation of age of farmer to "exposures" and "takes"

Group	Number of farmers	Percentage of farmers exposed to extension teaching	Percentage of farmers influenced by extension to adopt practices	Percentage exposed who were influenced
30 years and under.....	50	94.0	86.0	91.5
31 - 35.....	35	94.3	88.6	93.9
36 - 40.....	55	100.0	92.7	92.7
41 - 45.....	54	96.3	92.6	96.2
46 - 50.....	48	100.0	95.8	95.8
51 - 55.....	33	97.0	90.9	93.8
56 - 60.....	47	97.9	93.6	95.6
61 and over.....	21	95.2	85.7	90.0

Membership in Farm Bureau

The factors previously considered are all largely beyond the control of extension workers. The question of whether the farmer is a member of the farm bureau or not is quite largely determined by the activities of the county extension worker, since the county farm bureau is the official extension association of farmers according to Kansas State law.

That there was a direct relationship between membership in the county farm bureau and the adoption of improved wheat practices is apparent from Table 21. Nearly 100 per cent of the farm-bureau members made practical use of extension information. The members also made from 60 to 100 per cent more changes per farm than did nonmembers and former members. Exactly the same ratio prevails with regard to exposures to the different extension means and agencies, indicating a close correlation between the two factors.

Table 21. - Relationship of membership in farm bureau to adoption of wheat practices

Group	: Number : of : farm- : ers	: Percentage : of all : farmers	: Aggregate num- : ber of means : and agencies : exposed to : per 100 farms	: Percent- : age of : farmers : adopting : wheat : practices	: Practices : adopted : per : 100 : farms
Members of farm bureau..	121	35.3	888	98.3	639
Former members.....	84	24.5	532	92.8	326
Nonmembers.....	138	40.2	546	84.0	393

Adoption of Practices v. Membership. When the membership table is turned around and considered in the light of the possible influence of practices adopted on membership it is found that as the number of practices per farm increased the percentage of members also increased. One out of every six adopting three improved practices was a member. Of those adopting six practices, one out of two was a member. Of those farmers who adopted from 9 to 12 practices, 3 out of every 4 were members of the farm bureau. Where no practices had been adopted only 1 farmer in 14 was a farm-bureau member.

Table 21 a. - Effect of practices adopted on farm-bureau membership

Group	: Number : of : farms	: Average : number of : practices : adopted : per farm	: Percentage : who were : farm-bureau : members	: Percentage : who were : former : members	: Percent- : age who : were : nonmem- : bers
Farmers adopting no practices..	30	0	6.7	20.0	73.3
1 to 4 practices.....	135	2.66	17.0	29.6	53.3
5 to 8 practices.....	147	6.31	49.0	23.8	27.2
9 to 12 practices.....	31	9.77	77.4	9.7	12.9

Contact with Extension Workers

The importance of an extension worker's so organizing and conducting his work that over a period of years he will come into contact with nearly all the people he is attempting to serve is clearly emphasized in Table 22. Where the farmer had attended a wheat meeting or otherwise come into contact with an extension worker, the adoption of improved wheat practices was reported in 97 per cent of the cases as compared to 57 per cent reporting practices adopted in the no-contact group.

Table 22. - Relationship of contact with extension workers
and adoption of wheat practices

Group	Number of farmers	Percentage		Number of practices adopted per 100 farms
		of all farmers	of farmers adopting wheat practices	
Farmers having had contact with extension workers.....	296	86.3	96.6	511
Farmers having had no contact..	47	13.7	57.4	160

Approximately three times as many changes per 100 farms were reported for the contact group as for the no-contact group.

The close association of contact with extension workers and the adoption of practices helps to explain the larger influence of these means and agencies which make possible large numbers of contacts. (Table 13.)

ECONOMIC VALUE OF THE WHEAT-GROWING PRACTICES ADOPTED

In the last analysis the question of whether farmers will adopt and continue to use the wheat growing and marketing practices recommended by the extension service is largely, if not entirely, dependent upon the economic returns resulting from such action. Price, acreage, and other factors being equal, yield per acre is perhaps indicative of the financial returns from wheat farming. It is therefore worth while to compare the yields of wheat per acre on the farms where the various improved wheat practices included in the 5-year extension program for the wheat belt were followed and not followed. Preliminary to studying the influence of treatment for smut, crop rotation, and other practices upon yields of wheat, it is well to consider a few other factors which might also have had some bearing upon yields.

Wheat Acreage. Where large acreages of wheat were handled the average yield per acre declined somewhat, as shown in Table 23. This decrease however, is offset by the larger number of bushels of wheat produced per man. Where less than 300 acres of wheat was grown per farm the average yield in 1930 was 13.2 bushels per acre as compared to 11.1 bushels where from 300 to 499 acres was grown, and 11.4 where 500 or more acres of wheat was grown per farm.

It will be observed that the 129 farmers who harvested less than 300 acres obtained more bushels per acre than either of the other groups, in spite of the fact that they were below the average in the use of most of the improved practices listed in the table. It is probable that factors other than those considered in this study account for the larger yields on the smaller farms, or that certain practices affecting yields are more easily applicable to farms with smaller acreage.

Owner or Tenant Operated. Whether the farm was operated by owner or tenant seems to have had practically no influence upon the yield of wheat, since the wheat grown by owner operators yielded but one-tenth bushel more per acre than the wheat grown by tenants. (Table 24.) This is logical, since Table 15 indicates the same percentages of owners and tenants adopting improved wheat-growing practices.

Variety of Wheat Grown. The vast majority of farmers included in the study were growing one or more of the three standard varieties of wheat recommended by the extension service -- Blackhull, Turkey Red, and Kanred. The yields per acre of these varieties were very similar for the year the data were collected. (Table 25.)

Table 23. - Relation of acres of wheat harvested and yield per acre

Group	Number of farms	Acres of wheat per farm	Bush- els of wheat per acre	Percentage of farmers				
				Till- ing land before Aug.11	Seed- ing wheat com- pleted after Sept. 20	Rotat- ing wheat- land	Treat- ing seed for smut	Sowing pure seed
Under 300 acres.....	129	193	13.2	85.8	81.1	30.2	35.6	65.9
300 - 499 acres.....	144	376	11.1	87.0	89.4	31.2	42.4	68.8
500 acres and over.	70	678	11.4	82.6	95.6	50.0	51.4	67.1

Table 24. - Owner and tenant operated farms

Group	Number of farms	Acres of wheat per farm	Yield per acre
Owner.....	232	377	11.67
Tenant.....	111	352	11.56

Table 25. - Average yield per acre in relation to varieties grown

Variety of wheat	Number of farms growing variety	Acres of wheat grown per farm	Bushels of wheat per acre
Blackhull (only).....	101	344	12.15
Turkey Red (only).....	144	328	12.34
Kanred (only).....	11	527	11.29
Blackhull and Turkey Red.....	70	446	10.65
Other varieties.....	17	454	9.21

Pure Seed. Even though 98.8 per cent of all farmers interviewed were growing the standard varieties recommended, yet only 67 per cent of them were making a conscious effort to keep their seed pure. However, the quality of seed available in the area studied was rather uniformly pure, so little variation in yield due to this factor could be expected.

Table 26. - Yield of wheat as affected by pure seed

Group	Number of farms	Bushels of wheat per acre	Acres of wheat per farm	Percentage of farmers			
				Tilling wheat- land before Aug. 11	Seeding wheat com- pleted after Sept. 20	Rotat- ing wheat land	Treating seed for smut
Pure seed sown.....	231	11.7	378	86.6	88.6	89.0	48.0
Pure seed not sown.	112	11.6	350	83.8	85.3	25.9	28.6

Seed Treatment for Smut. The average yield of wheat per acre was .35 bushels higher on those farms where the seed was treated for smut. (Table 27.) A 2.6 per cent increase in yield due to seed treatment during a year when smut was not prevalent would seem a very satisfactory return for the cost and labor of treating the seed, in addition to the insurance against heavy loss. As these farms grew an average of 410 acres of wheat, seed treatment increased the amount of wheat raised 143 bushels per farm.

Table 27. - Treatment of wheat seed for smut in relation to yields per acre

Group	Number of farms	Bushels of wheat per acre	Acres of wheat per farm	Percentage of farmers			
				Tilling wheat-land before Aug.11	Seeding wheat-com-pleted after Sept.20	Rotat-ing wheat-land	Sowing pure seed
Seed treated.....	143	11.82	410	85.6	86.5	42.6	77.6
Seed not treated...	200	11.47	340	85.7	88.3	29.0	60.0

Rotation of Wheatland. About one-third of the farmers interviewed rotated their wheatland, some with summer-fallow, others with row crops, or legumes. Where rotation of crops was practiced the wheat yielded .37 bushels more per acre than where crops were not rotated. (Table 28.) This increased yield applied to 414 acres, the average of the farms where wheatland was rotated, indicates that the rotation of crops added 153 bushels of wheat per farm in 1930.

Table 28. - Rotation of wheatland as affecting yields per acre

Group	Number of farms	Bushels of wheat per acre	Acres of wheat per farm	Percentage of farmers			
				Tilling wheat-land before Aug. 11	Seeding wheat completed after Sept. 20	Treating seed for smut	Sowing pure seed
Rotate wheatland..	119	11.86	414	87.3	90.6	51.3	75.6
Do not rotate wheat land.....	224	11.49	345	84.8	86.0	36.6	62.9

Tillage Dates. Experiment-station data indicate that early plowing or otherwise breaking of the land to be sown to wheat has an important bearing upon yields. The experience of the farmers included in this study would seem to substantiate experimental results. With the exception of the 38 farms completing the first tillage operation before July 11th, where for some reason not readily accounted for the yield of wheat was very low, on all of those groups of farms where this first tillage of wheatland was completed before August 10 the yield of wheat was about 2 bushels more per acre than was true of those farms where tillage was delayed until after August 10th. (Table 29.)

Table 29. - Yields of wheat per acre as affected by time
first tillage of wheatland was completed

Group	Number of farms	Bushels of wheat per acre	Acres of wheat per farm	Percentage of farmers			
				Seeding wheat com- pleted after Sept.20	Rotat- ing wheat- land	Treat- ing wheat seed	Sowing pure seed
Tillage completed before July 11.....	38	8.8	473	89.5	42.1	52.6	84.2
July 11 - 20.....	93	12.3	349	87.1	52.7	53.8	86.0
July 21 - 31.....	70	12.8	349	87.0	35.7	37.1	55.7
August 1 - 10.....	83	12.6	363	84.0	14.4	26.5	48.2
After August 10.....	48	10.6	363	93.6	31.2	41.7	62.5

Dates of Seeding. Extension recommendations regarding dates of seeding wheat in the wheat belt have been to avoid early seeding on account of the Hessian fly, and to avoid very late seeding, which results in small growth before the growing season ends. In general the best seeding dates are considered to be between September 20 and October 10. Again experience of farmers checks with extension recommendations. (Table 30.)

Table 30. - Time of seeding wheat in relation to yield per acre

Group	Number of farms	Bushels of wheat per acre	Acres of wheat per farm	Percentage of farmers			
				Tilling wheat-land before Aug. 11	Rotating wheat-land	Treating seed for smut	Sowing pure seed
Wheat seeding started							
September 1-10	60	11.4	358	86.4	31.7	35.0	61.7
September 11-20	167	11.2	394	82.7	32.3	33.5	67.1
September 21-30	89	13.3	331	89.6	42.7	53.9	69.7
October 1 and later.....	24	9.6	370	91.7	33.3	70.8	79.2

Those farmers who delayed beginning the seeding of wheat until after September 20 but who began seeding before October 1 obtained an average yield of 13.3 bushels per acre. This is 2 bushels more than was obtained from earlier seedings, and 3.7 bushels more than resulted from later seedings. Date of seeding is apparently an important factor in determining wheat yields.

Insect Control. Hessian flies, grasshoppers, and strawworms are some of the worst insect pests with which farmers have to contend in the areas covered by this study. Cultural practices such as early preparation of seed bed, control of volunteer wheat, and delayed seeding are the chief ways of combating the Hessian fly and the strawworm. Grasshoppers are controlled by means of poisoned bait.

The yield of wheat on farms where some attempt was made to control insects averaged 1.04 bushels per acre higher than on farms where no attempt at insect control was made. (Table 31.) In other words the insect-control practices followed resulted in the production of 387 more bushels of wheat per farm.

Table 31. - Wheat yields as affected by insect control

Group	Number of farms	Bushels of wheat per acre	Acres of wheat per farm
Attempt to control insects.....	278	11.82	372
No attempt to control insects.....	65	10.78	355

Tillage Implements Used. As the kind of tillage implements used in the first operation of preparing land for wheat seeding is important from several standpoints, but especially from that of insect control, it is interesting to group the farms according to the type of tillage implement used. Of the 306 farms reporting on this question 159 used a moldboard plow or lister exclusively, whereas 147 used a one-way or disk harrow either alone or in combination with other tools. The farms in the former group yielded 1.7 more bushels of wheat per acre in 1930 than the farms in the latter group.

Table 32. - Relation of tillage implement used to yields

Implement used	Number of farms	Bushels per acre	Acres of wheat per farm
Moldboard or lister.....	159	12.94	304
One-way disk alone or with other implements.....	147	11.23	431

Number of practices adopted. Having considered the influence of many of the individual practices advocated by the extension service upon per-acre yields of wheat, it is fitting to take up next the question of cumulative affect on yields of the adoption of varying numbers of the improved practices recommended. In Table 33 the farms have been grouped according to the number of changes made due to extension influence.

The farmers adopting no extension practices obtained a yield of 9.40 bushels of wheat per acre, whereas, taken as a group, the farmers adopting improved wheat practices obtained an average yield of 11.84 bushels per acre. If the rate of increase in yield per acre, 2.44 bushels, is applied to the 370 acres of wheat grown per farm in the practice group, a total increase of 903 bushels of wheat per farm is due to extension influence. Since these farms averaged to adopt 5.1 practices, the value of each practice may be computed as approximately 177 bushels of wheat.

It will be noted also from Table 33 that yield per acre increases with increased numbers of practices adopted.

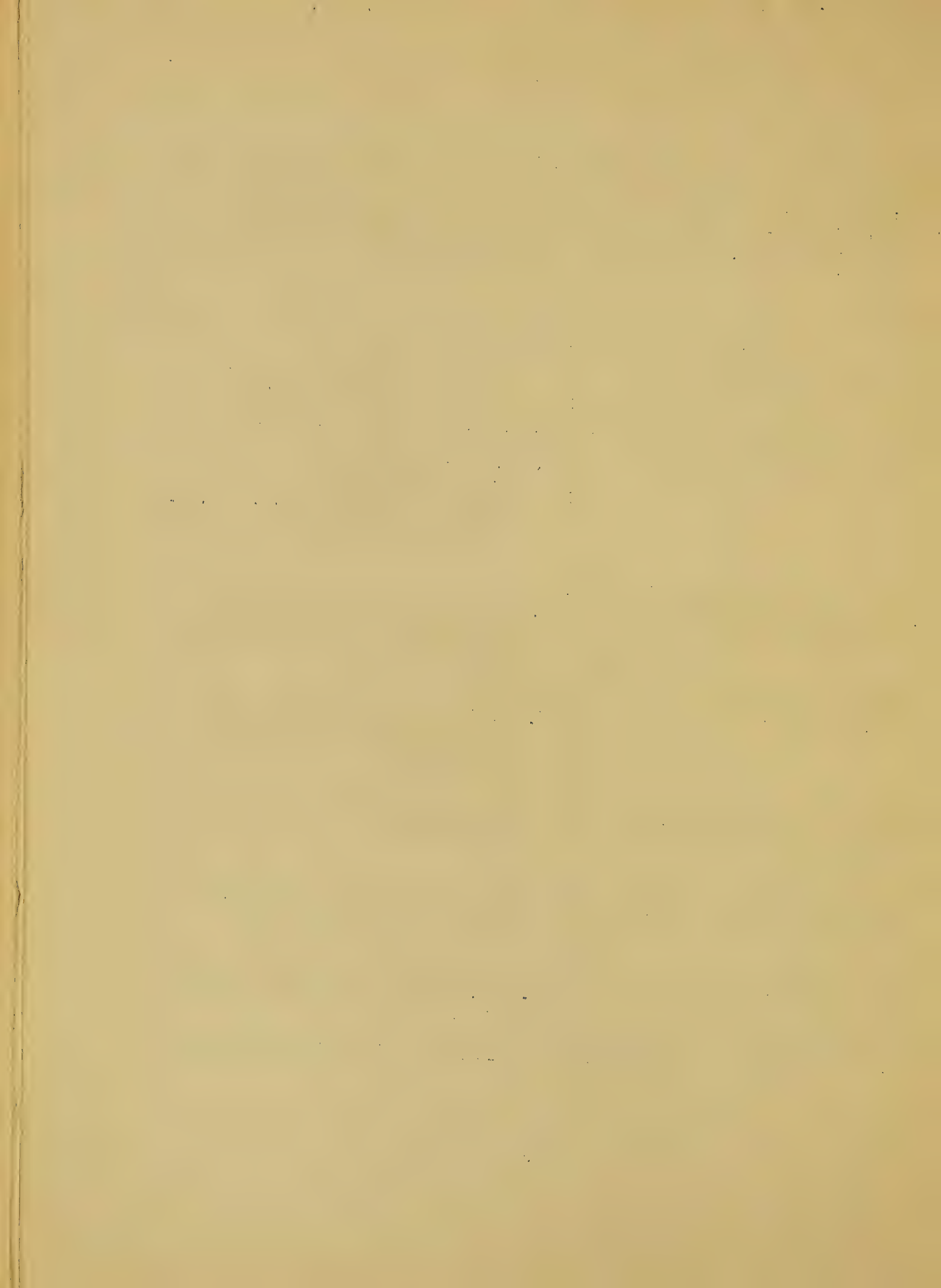
Table 33. - Yield of wheat per acre as affected by number of practices adopted

Group	Number of farms	Average number of practices adopted per farm	Acres of wheat per farm	Bushels of wheat per acre
0 practices adopted.....	30	0	354	9.40
Any practice adopted.....	313	5.1	370	11.84
1 to 4 practices adopted.....	135	2.66	360	11.21
5 to 8 practices adopted.....	147	6.31	366	11.90
9 to 12 practices adopted.....	31	9.77	439	13.85

SUMMARY

Since the 343 farms in the two typical wheat-belt counties were studied primarily to determine the influence of the 5-year wheat extension program upon farm practices, a comparison of the situation on these farms at the end of the 5-year period with the goals outlined at the beginning of the program in 1926, should afford the best possible measure of the success of the undertaking. There follows such a comparison.

Goal outlined at beginning of 5-year program	Situation at end of 5-year period
1. Insect control practiced by 80 per cent of farmers	1. 81.0 per cent of farmers practicing some insect control Hessian fly control.....61.5% Poisoning grasshoppers.....57.7% Strawworm and other insects.....12.5%
2. Smut of wheat and sorghum controlled by 80 per cent of farmers	2. 41.7 per cent of farmers treating wheat for smut in 1929 or 1930 39.4 per cent of farmers treating sorghum for smut
3. Market reports followed by 20 per cent of farmers	3. 22.7 per cent of farmers using outlook information in connection with production and marketing operations
4. Wheat sold on quality and grade basis by 80 per cent of farmers	4. 49.6 per cent of farmers selling on quality basis
5. Standard varieties of all crops grown by 80 per cent of farmers	5. 98.6 per cent of farmers growing standard varieties of wheat
6. Crop rotation practiced by 15 per cent of farmers	6. 34.7 per cent of farmers rotating wheatland



Ninety-one and two-tenths per cent of all the farms in the area were influenced by extension teaching to adopt improved wheat practices.

The farms reporting practices adopted as a result of extension influence averaged 5.1 practices per farm. This represents 42 per cent of all the practices recommended in the 5-year wheat-belt program.

About one farmer in four reported contacts with the local leader. Eighty-eight per cent of these farmers adopted practices because of the local leader's influence. Local leaders influenced an average of six persons per leader.

Factors outside of extension such as distance from extension office, kind of roads, tenure, and acres of wheat grown had little influence on the number of practices adopted.

Membership in the farm bureau was closely related to exposure to extension teaching activities and to the adoption of improved practices. Farm-bureau members were exposed to 63 per cent more kinds of extension activities and adopted 62 per cent more practices per farm than nonmembers.

Of all the factors influencing the acceptance of extension information by farmers, by far the most important was contact with extension workers through participation in extension or otherwise.

For the first time in an extension field study data were obtained relating to the economic value of the adoption of improved practices, using yield of wheat per acre as a measure. The farmers following the recommendations of the extension service averaged to obtain 2.44 more bushels of wheat per acre than did the farmers not following such practices. Inasmuch as the farmers adopting practices grew 370 acres of wheat, this is an increase of 903 bushels per farm due to extension practices, or an average of 177 bushels per farm on each of the practices changed by the farmers influenced.



